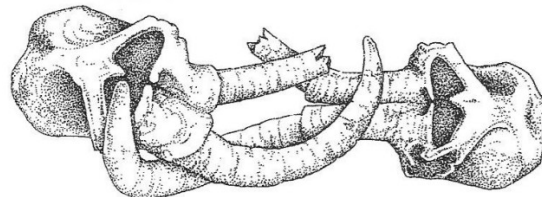


STATION A



1. Mammoths are often depicted as having been Arctic-dwelling creatures whose habitats were dominated by ice and snow during much of the year. What can be determined about a mammoth's lifestyle to contradict this statement?
2. For its size, a mammoth had relatively small ears and tails. Explain why.
3. List three adaptations this creature may have used for defending both itself and its young.
4. What major activity dominated the life of a mammoth?
5. The pair of mammoth fossils, with interlocking tusks, in the image below was unearthed in Nebraska. In what kind of activity were these mammoths most likely engaged at the time their tusks became interlocked, ultimately resulting in their deaths? (Be specific.)

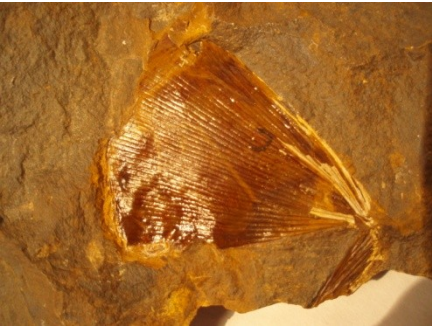


6. Mammoth bone "a" found in Siberia is much less dense than dinosaur bone "b" found in Montana. The mammoth bone is brown in color and has a similar appearance to many other old bones one might happen to find elsewhere. Bone "b" is much more stone-like in appearance and density. Why was this mammoth bone not preserved as stone?



7. Image "c" shows hairs from a mammoth discovered in Siberia. Note the two different lengths and textures of hair. Describe the functions of each kind.

STATION B

a	b	c	d
			

1. Record the names of each of the leaves above on lines a through d on the response sheet.



2. The cone in the image above is from a tree represented by one of the four fossil leaves at this station. Which of the four trees produced this cone?
3. Which of these trees was the dominant type of vegetation during the Carboniferous Period, 359-299 million years ago?
4. Which of these trees is commonly referred to as the “dawn redwood?”
5. Which of these trees was known only from its fossils until a surprising discovery of a small grove in China in 1941?
6. Which of these trees holds the unique role as the sole living link between the ferns and the conifers?
7. Which of these trees provided a key piece of paleontological evidence in support of Alfred Wegener’s Continental Drift Hypothesis?

STATION C

Seven fossils, preserved in a variety of ways, have been imaged below. Match each with its method of preservation by entering the matching letters on the lines provided.

 1	 2	 3	 4
 5	 6	 7	 8

1. Tree branch

2. Jellyfish

3. Coprolite

4. Brachiopod

5. Dinosaur skin (plastic replica)

6. Leaf

7. Insect in amber

8. Gastropod/Bivalve

a. unaltered remains

b. steinkern or cast

c. carbonization or distillation

d. petrification or permineralization

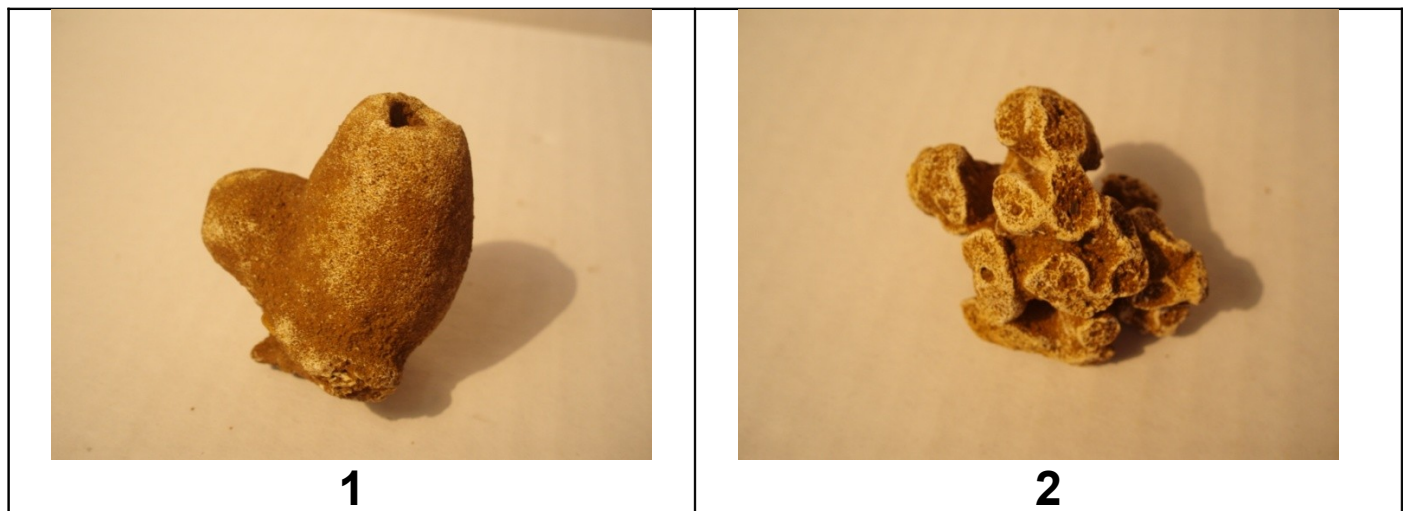
e. trace fossils

f. pyritization

g. mold

- **Molds and Casts** - Molds are imprints made in soft sediments that are preserved when the sediments are lithified (turned to stone) and the skeletal remains have been dissolved away. A mold can later be filled in by sediment creating a cast. A cast thus forms a replica of the original remains. Casts are relatively rare in nature.

STATION D



1. To which phylum do creatures 1 and 2 belong?
2. What inherent physical characteristic of these creatures led to the choice of its phylum name?
3. T/F. These creatures evolved during the latter years of the Precambrian and survived all major mass extinctions.
4. T/F. These creatures were the most primitive forms of to evolve a variety of different cells capable of functioning cooperatively for survival.

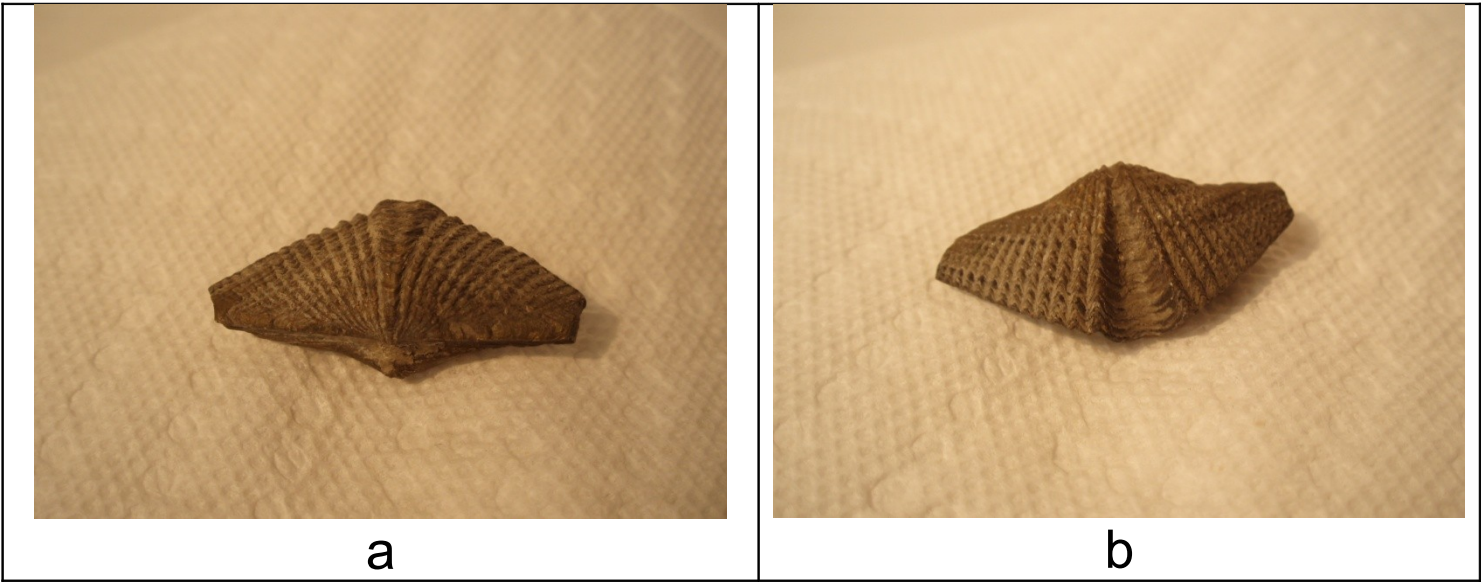


5. Certain members of this phylum possessed hard calcareous or siliceous, needle-like structures which helped them retain their shape. A number of these structures are preserved on the surface of the rock imaged above. Record the names of these needle-like structures.
6. In addition to these needle-like structures, some of these creatures produced structural organic fibers to help maintain body shape. What were these needle-like fibers called?
7. What specialized types of cells directed water to flow through these creatures in a unidirectional flow and, once nutrients had been removed, continued to direct the water out of their bodies?

STATION E

			
Composita	Platystrophia	Atrypa	Mucrospirifer

- 1. Which of the four fossil specimens imaged above lacked interlocking hinge mechanisms, having the valves held together only by muscles?
- 2. What organ did the mucrospirifer use to anchor itself to the sea floor?
- 3. All brachiopods have two valves. Contrast the appearance of the left and right sides of the top surface of the mucrospirifer with that of its upper and lower valves. Which of the following statements, “a” or “b,” accurately describes the difference in appearance?



- a. The left and right sides of each valve appear more similar.
 - b. The top and bottom valves appear more similar.
4. The mucrospirifer’s valves are referred to as “pedicle” and “brachial.” Usually, the pedicle valve has a raised area called its “fold,” and the brachial valve has a depression. Which valve is shown in image “a”? Which valve is shown in image “b”?

STATION F



1. Identify the model of an ancient fish in the image above.
2. To what class did this ancient fish belong?
3. During which period of the Paleozoic Era did this fish thrive?
4. Describe the two parts of this creature most likely to be preserved as fossils.
5. You are approached by a fossil dealer stating that he has teeth from the ancient fish represented by the model at this station. He states that he is willing to part with several of these teeth at a very special price. How do you know that this individual is attempting to con you?



6. To what class does the fossil fish imaged above belong?



7. To what class does the fish whose tooth is shown above belong?
8. What is the major difference between the skeletons of two classes identified in questions 6 and 7?

STATION G

		
a	B	c
		
d.	e.	f

1. Record the names of each echinoderm, or part of an echinoderm, on lines a through f on your response sheet.
2. Which of these creatures was a passive suspension feeder, meaning that it relied solely upon extrinsic, ambient water movement?
3. During the Paleozoic era, vast “forests” of the creatures shown in “a” and “f” above lived in shallow, near-shore environments. Describe the only places in the oceans where these creatures may still be found living today.
4. Which of these creatures produced a powerful adhesive that permitted it to move up and down smooth surfaces?
5. Which of these creatures had tube feet with suckers, used for locomotion and feeding, at their tips?
6. Which of these creatures had only a limited degree of mobility resulting in its spending much of its time half-buried within ocean sediments?
7. Which two of these creatures were high-level, stalked suspension feeders, filtering food particles out of the water column?
8. Fill in the missing terms: Theca is to _____ as calyx is to _____.

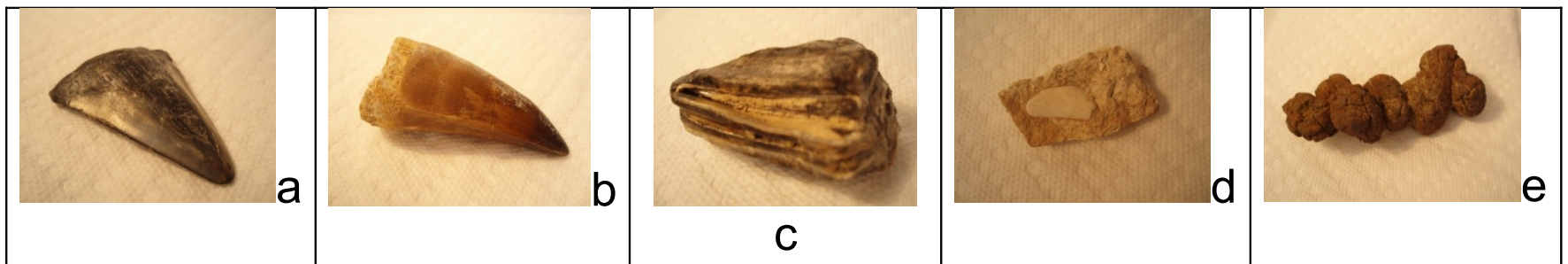
STATION H



1. Identify the two bryozoans, labeled “a” and “b” above.
2. These specimens were given the Latin term “bryozoans” as their phylum name. By what two-word phrase are these animals frequently referred?
3. Did bryozoans exist as solitary or colonial creatures?
4. Archimedes, an ancient Greek citizen, invented a mechanical device very similar in shape to the bryozoans that now bear his name. What kind of device was this?
5. Creatures in two different phyla had unique feeding and respiratory organs called “lophophores” resembling rubber bands covered with tiny hairs. By moving these hairs, a current was generated to transport water and food particles toward them. One of the phyla possessing these lophophores were the bryozoans. To which phylum did the other creatures with these special adaptations belong?

STATION I

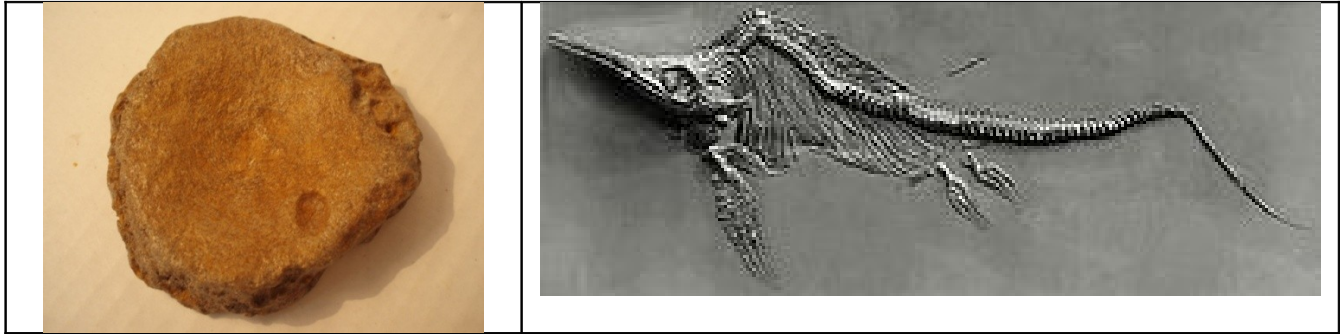
Directions: An image and description has been provided for each of the five fossils at this station, followed by a series of questions.



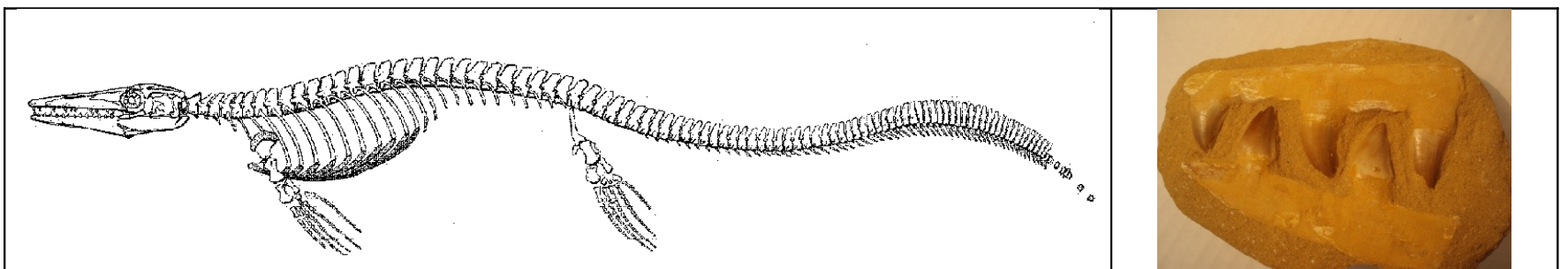
- a. Triangular-shaped tooth
- b. Slightly curved, pointed tooth
- c. A tooth with a ridged, flat surface (top surface facing right)
- d. A white-colored piece of coprolite
- e. A rope-like textured piece of coprolite

1. Why were only the teeth of ancient sharks frequently preserved?
2. To what creature did the slightly curved, pointed tooth belong?
3. What kind of food did the creature with flat, ridged teeth consume?
4. Which piece of coprolite, “d” or “e,” was dropped by an herbivorous creature?
5. Which piece of coprolite, “d” or “e,” was dropped by a carnivorous creature?
6. Which two of these specimens may be classified as trace fossils?
7. List at least one environmental condition or action that permitted these coprolites to be preserved as fossils.
8. List two kinds of information that may be determined by studying the droppings from creatures now fossilized as coprolites.

STATION J



1. Identify the creature to the right in the images above.
2. Identify the part of this creature's skeleton shown to its left.
3. These creatures lived during the same era as did the dinosaurs, however they became extinct 90 million years before the dinosaurs met the same fate. During which era did these creatures live?
4. Although this creature is not a fish, its fins performed a similar function employing a similar mechanism. Is this an example of convergent or divergent evolution?



The set of teeth in the image to the right belonged to the same kind of creature whose skeleton appears at the left. This creature evolved at nearly the same time as the creature imaged at the very top of this station card.

5. What clue indicates that this creature was carnivorous?
6. Identify this creature.

The model of the ancient creature at this station is considered to be an ancient ancestor of the mammals.



7. Identify this creature.
8. Although several proposals for its use have been suggested, no one can be absolutely certain of the actual function of this creature's large sail. Use your knowledge of fossils and paleontology to develop a hypothesis of your own.

STATION K

a 	b 	c 
d 	e 	f 

- Record the name of each creature, “a” through “f,” on your response sheet.
- Which of these fossils is sometimes referred to as the “Devil’s toenail?”
- What is the name of the heavily calcified, unchambered posterior portion of the internal skeleton appearing in “e” above? Caution: This question is not asking for the name of the creature of which this fossil was once a part.
- Which of the following statements is untrue about specimen “f”?
 - This creature used its gills for filter feeding.
 - This creature actively crawled on a large muscular foot.
 - This creature most likely lived in a huge settlement of individuals.
- Locate the small funnel-like protrusion at the base of the tentacles and beneath the eye of this creature. What was the function of this organ?
 - This creature’s body is divided into numerous chambers, separated by internal walls called septa. The positions of the septa are reflected by visible features on its outside surface. What are these features, located on the outside of the creature, called?
- Each of the creatures in images “a” and “b” had a siphuncle, a tiny tube which joined the chambers together. The end of a siphuncle may be seen in the small, cylindrical cross-section in image “e.” This organ was used to vary the amount of gas held within each chamber. What function did the varying amounts of gas controlled by the siphuncle serve?
- Which of the fossilized creatures in the chart above used venom to capture its prey, escape from and defend against predators, and possibly deter competitors?

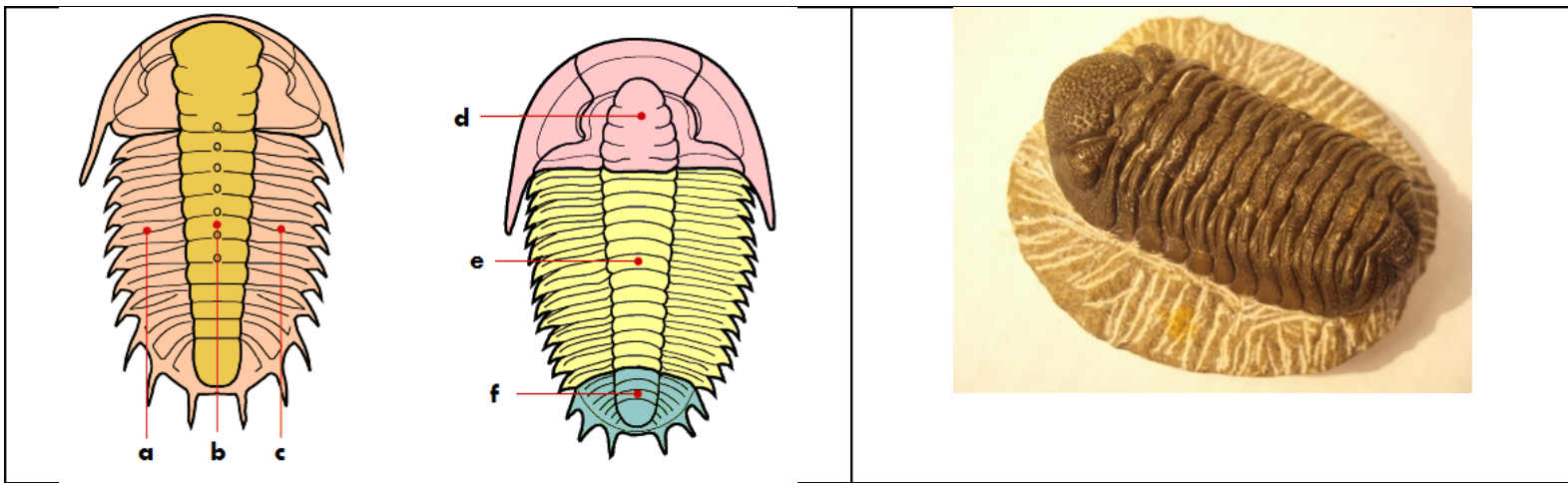


STATION L



1. Identify each type of coral shown in the images above.
2. Which coral's thecae appear as a tightly-packed, hexagonal arrangement bordered by six neighboring thecae?
3. Which solitary coral, also known as rugose, generally added a new growth layer each day? By counting these growth layers, paleontologists calculated the length of a year during the Devonian period as being about 400 days.
4. Which specimen is commonly referred to as "chain coral" due to its patterned resemblance to links of chain attached side-by-side?
5. Which colonial coral possessed closely adjoining corallites, usually with shared walls, giving it a honeycomb-like appearance? These colonies formed irregular nodular masses, sometimes branched, with numerous corallites within each branch.

STATION M



1. A trilobite's external surface included an axial lobe, a cephalon, a left pleural lobe, a thorax, a pygidium, and a right pleural lobe. Identify each part of the trilobite labeled "a" through "f" in the diagrams above.
2. Which one of the following phrases was not applicable to the life style of any of the many species of trilobites?
 - a. predator
 - b. pelagic
 - c. scavenger
 - d. parasitic
 - e. filter feeder
 - f. bentic
3. Which is generally the only part of a trilobite preserved as a fossil? (You must be specific.)



4. Identify the fossil in the image directly above.
5. These creatures were suspension feeders that permanently attached themselves to a hard substrate or other type of objects. They had feathery appendages that beat rhythmically to and fro for long periods of time. What purpose did this rhythmical beating serve?

IMPORTANT NOTICE!

This exam has been modified from the original by the inclusion of images of the actual specimens. The use of images also required modifications of the original text, but the basic concepts remain the same.

Similar specimens of many of those included in this exam may be purchased from Other Worlds Educational Enterprises, LLC. This company also offers additional coaching aids to support the Earth-Space Events of the Science Olympiad. Please visit <http://www.otherworlds-edu.com> for further information.

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